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Test 614: Case 301 Diesel

Tractor Test & Power Museum

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The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering
Dates of test: April 15, 1957 to April 23, 1957
Manufacturer: J. I. CASE COMPANY,
RACINE, WISCONSIN
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 614

CASE 301 DIESEL

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury
		Gal per hr	Hp-hr per gal	Lb per hp-hr	Cooling medium	Air wet bulb	Air dry bulb	

TESTS B & C—100% MAXIMUM LOAD—TWO HOURS

30.80	1750	2.227	13.83	0.506	176	54	60	28.893
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TEST D—RATED LOAD—ONE HOUR

27.10	1751	1.906	14.22	0.493	170	54	59	28.900
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TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)

26.98	1755	1.876	14.38	0.487	174	55	60
1.50	1890	0.707	2.12	3.300	122	56	61
14.27	1827	1.277	11.17	0.626	156	56	62
30.13	1653	2.155	13.98	0.501	170	56	63
11.44	1835	1.135	10.08	0.695	150	55	61
20.77	1782	1.538	13.50	0.519	168	55	61
17.52	1790	1.448	12.10	0.579	157	55	61	28.900

TEST L—OPERATING MAXIMUM TORQUE

% of rated rpm (engine)	100	95	90	85	81	75	71	64	60	54
% of rated-speed torque	100	103	106	107	107	111	110	106	104	101

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury
					Gal per hr	Hp-hr per gal	Lb per hp-hr	Cool- ing med	Air wet bulb	Air dry bulb	

TEST H—RATED LOAD—TEN HOURS—3rd Gear

22.39	1658	5.06	1750	3.34	1.754	12.77	0.549	171	59	62	28.810
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TESTS F & G—100% MAXIMUM LOAD

25.06	4067	2.31	1746	14.53	1st gear (part throttle)			166	48	50	28.980
28.56	2860	3.74	1750	6.00	2nd gear.....			174	48	50	28.970
28.73	2151	5.01	1748	4.31	3rd gear.....			170	48	50	28.960
23.60	693	12.77	1755	1.49	4th gear.....			158	51	54	28.980

TEST J—OPERATING MAXIMUM LOAD

26.31	1984	4.97	1754	6.67	3rd gear.....			173	66	77	29.560
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TEST K—OPERATING MAXIMUM LOAD

25.22	2267	4.17	1750	14.40	3rd gear.....			172	55	65	28.990
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TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	291 lb each	None	None
Added cast iron	687 lb each	None	None
Rear tires			
No. and size	Two 12-28	Two 12-28	Two 10-28
Ply	4	4	4
Air Pressure	14 lb	14 lb	12 lb
Front wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	43 lb each	None	None
Added cast iron	188 lb each	None	None
Front tires			
No. and size	Two 5.50-16	Two 5.50-16	Two 5.50-16
Ply	4	4	4
Air pressure	28 lb	28 lb	28 lb
Height of drawbar	14 inches	15 inches	12½ inches
Static weight			
Rear end	4274 lb	2318 lb	2240 lb
Front end	1712 lb	1250 lb	1240 lb
Total weight as tested with operator	6161 lb	3743 lb	3655 lb

FUEL, OIL, WATER and TIME Fuel Diesel Cetane No. ASTM 50 (rating taken from oil company's typical inspection data) **Weight per gallon** 7.003 lb **Oil** SAE 10-10W **To motor** 1.268 gal **Drained from motor** 0.947 gal **Water used** 0.221 gal **Total time motor was operated** 41 hours.

CHASSIS TYPE Tricycle **Serial No.** 6075362 **Tread width rear** 48" to 88" **front** 6¼" and 1½" **Wheel base** 84¾" **Hydraulic control system** direct engine drive with throw out lever **Advertised speeds mph** first 2.68 second 3.94 third 5.18 fourth 12.80 **reverse** 3.19 **Belt pulley diam.** 10¼" **face** 6" **rpm** 1190 **Belt speed** 3193 fpm **Belt flat** Length 57" **Width** 5" **Thickness** 0.210" **Maximum slip** 0.80% **Clutch** single plate dry disc operated by foot pedal **Seat** pressed steel cushioned by rubber in torsion **Brakes** double disc brakes operated by two foot pedals **Equalized** by locking pedals together **Power take-off** conventional type **Steering** power steering not available.

ENGINE Make Continental **Type** 4 cylinder vertical Diesel **Serial No.** 4114 **Crankshaft** mounted lengthwise **Head** 1 Lubrication pressure **Bore and stroke** 3⅝" x 4⅜" **Rated rpm** 1750 **Compression ratio** 15.54 to 1 **Displacement** 157 cu. in. **Port diameter valves** Inlet 1 3/16" Exhaust 1 1/16" **Governor** variable speed centrifugal **Starting system** 12 volts (two-6 volt batteries) **Air cleaner** oil washed wire mesh **Muffler** was used **Oil filter** replaceable treated paper element **Fuel filter** one edge wound metal filter removable for cleaning, one filter with replaceable element and one replaceable sealed filter **Cooling medium temperature control** thermostat.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with a fuel pump setting selected by the manufacturer to develop approximately 31.8 corrected maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, J, K and L were made with the same setting.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	29.40	31.89
2. Observed maximum horsepower (tests F and B)	28.73	30.80
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	22.05	27.11

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 614.

L. F. LARSEN

Engineer-in-Charge

L. W. HURLBUT (Chairman)
G. W. STEINBRUEGGE
J. J. SULEK
Board of Tractor
Test Engineers

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

TEST D: The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E:

Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each; rated load, no load, $\frac{1}{2}$ rated load, maximum load at wide open throttle valve, $\frac{1}{4}$ and $\frac{3}{4}$ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

TEST L: This torque test is run with wide open throttle. Loads are applied to reduce engine speed in approximately ten 5% increments. Rated speed equals 100%. The corresponding dynamometer torque is recorded as a per cent of torque at rated speed.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instru-

ment in the test car. When rubber tires are used, all tests are made on the concrete test course. All crawler type tractors are tested on a dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: Similar to test J except that the smallest tires and lightest wheels offered by the manufacturer are used.

